An Overview of the GOES-R Program

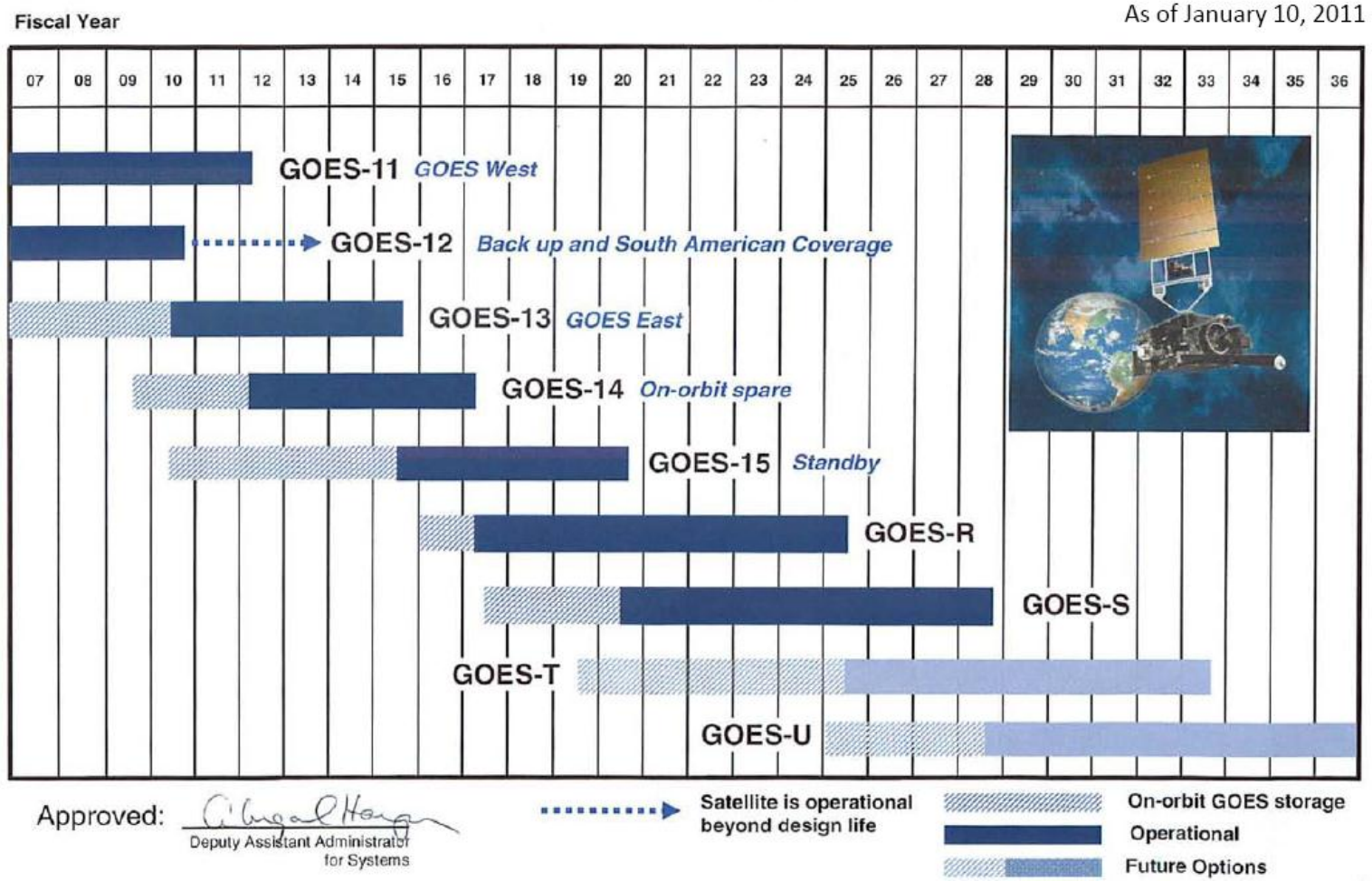
Greg Mandt

GOES-R System Program Director

2011 GOES-R AWG Review

June 14, 2011

Continuity of GOES Operational Satellite Program



GOES-R Mission Overview

GOES-R is the next generation of GOES satellites that will provide a major improvement in quality, quantity, and timeliness of data collected.

Earth Pointing

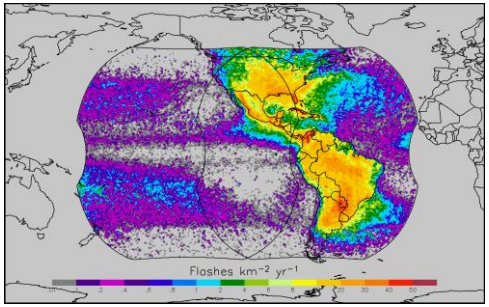
ITT

Visual & IR Imagery

- *Advanced Baseline Imager (ABI)*

LOCKHEED MARTIN

Lightning Mapping

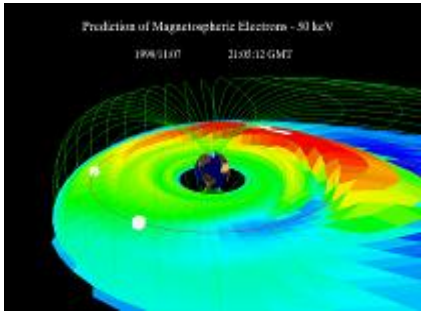


- *Geostationary Lightning Mapper (GLM)*

In-Situ

Assurance Technology Corporation

Space Weather Monitoring

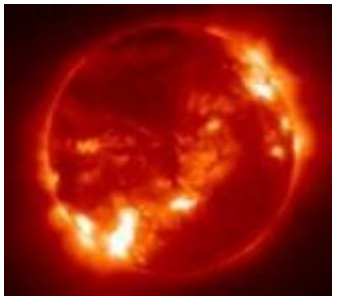


- *Space Environment in-Situ Sensor Suite (SEISS)*
- *Magnetometer*

Sun Pointing

LOCKHEED MARTIN
LASP

Solar Imaging

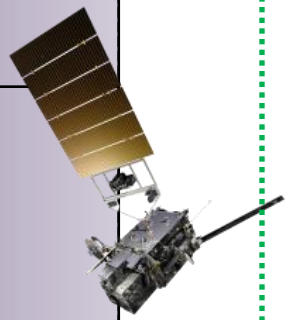


- *Solar Ultra-Violet Imager (SUVI)*
- *Extreme UV/X-Ray Irradiance Sensors (EXIS)*

New and improved capabilities for:

- Increased lead times for severe weather warnings
- Better storm tracking capabilities
- Solar, space weather, and climate analyses
- Advanced products for aviation, transportation, commerce

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Program/ System		System Design Review complete ✓			Working to System PDR in August 2011			Launch Readiness Oct. 2015	
Flight Segment	Spacecraft		Spacecraft SDR complete ✓		✓ PDR held January 2011				
	Instruments ✓	5 Instrument contracts underway		All instruments have passed CDR ✓	✓ ABI delta CDR complete				
Ground Segment	Core contract awarded to Harris Corp. ✓		Core SRR complete ✓	80% delivery of baseline product algorithms ✓	✓ Core GS PDR complete		Antenna System PDR completed April 2011 ✓		
				RBU lease awarded ✓	GS Project PDR in June 2011				



Development → Integration and Testing

Budget Situation

	FY10	FY11	FY12
Last Year	$664M	$730M	$774M
Current	$641M	$662M	$615M

Impact of Reductions:

- Remove Option 1 latency and Option 2 products from Harris contract
- Reduce some IT Security features
- Move some hardware purchases out of FY12

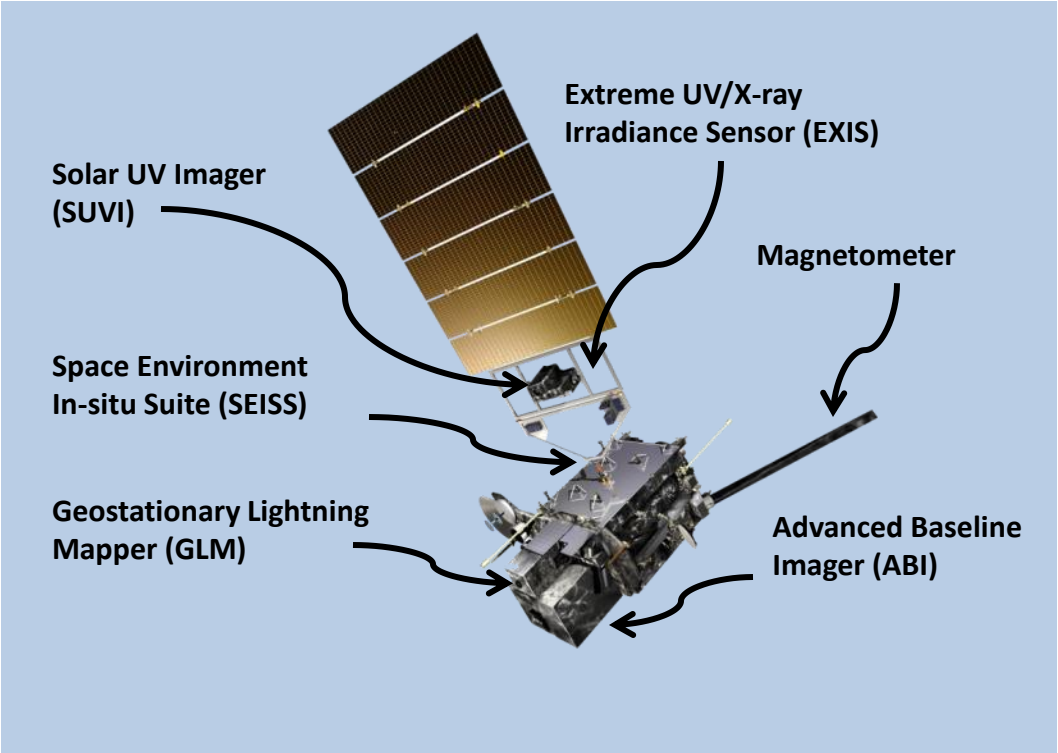
GOES-R Spacecraft

Specifications

- **Size** ~5.5 meters (from launch vehicle interface to top of ABI)
- **Mass** Satellite (spacecraft and payloads) dry mass <2800kg
- **Power Capacity** >4000W at end-of-life (includes accounting for limited array degradation)
- Spacecraft on-orbit life of 15 years with orbit East-West and North-South position maintained to within +/-0.1 degree

Current Status

- Design activities progressing well
- Spacecraft System Definition Review (SDR) completed March 9-10, 2010
- Spacecraft baseline established in April 2010
- Preliminary Design Review (PDR) held January 18-20, 2011



Lockheed Martin Space Systems Co (LMSSC) of Newtown, PA is primary contractor

Advanced Baseline Imager (ABI)

Specifications

- 16 channel imager
- Improves upon current capabilities in spectral information (3X), spatial coverage (4X), and temporal resolution (5X)
- Improves every product from current GOES Imager and will offer new products for severe weather forecasting, fire and smoke monitoring, volcanic ash advisories, and more

Current Status

- ABI PTM instrument successfully completed all environmental testing this year culminating with thermal-vacuum (TVAC) testing in November 2010
- ABI delta Critical Design Review (CDR) held February 22-24, 2011
- Proto-Type Model (PTM) is currently undergoing risk reduction characterization testing
- Proto-Flight Model (PFM) fabrication is well underway

ABI Proto-Type Model (PTM)

ITT Corporation of Ft. Wayne, IN is primary contractor

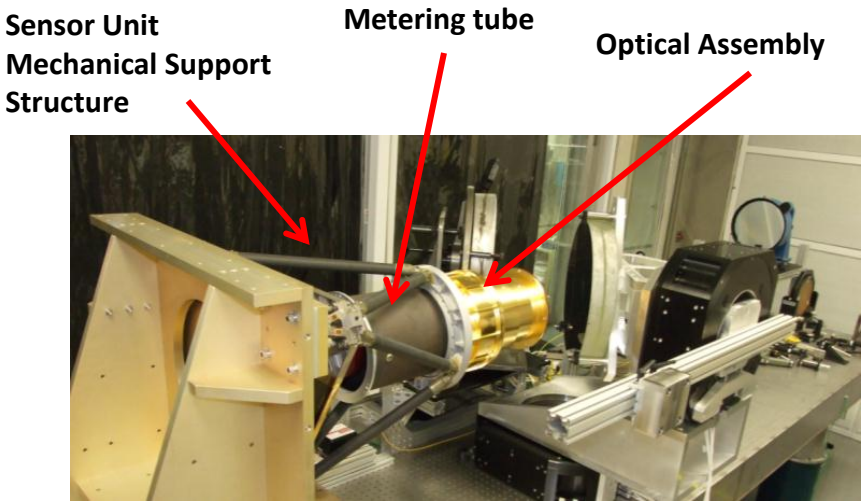
Geostationary Lightning Mapper (GLM)

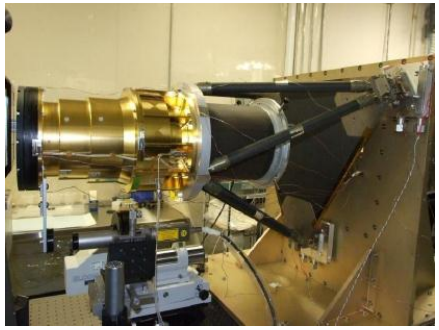
Specifications

- **Detects total lightning**: in-cloud, cloud-to-cloud, and cloud-to-ground
- 70-90% flash detection day and night
- Near uniform spatial resolution
- Aids in forecasting severe storms and tornado activity, and convective weather impacts on aviation safety and efficiency
- Currently no ocean coverage, and limited land coverage in dead zones

Current Status

- Lockheed Martin Applied Technology Corp (Palo Alto, CA) is primary contractor
- Critical Design Review (CDR) completed in December 2010
- Electronics Unit CDR completed in April 2011
- Flight fabrication is underway



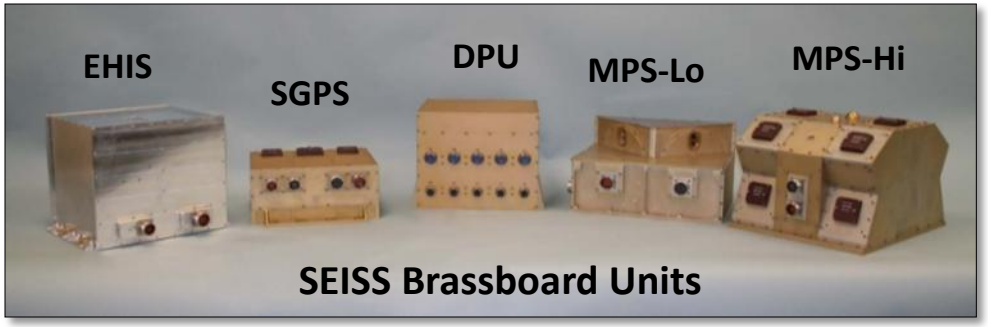


Lockheed Martin Advanced Technology Corp of Palo Alto, CA is primary contractor

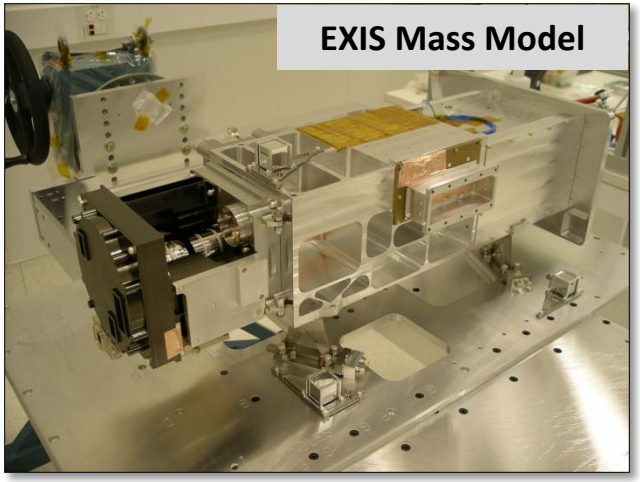
Space Weather Instruments

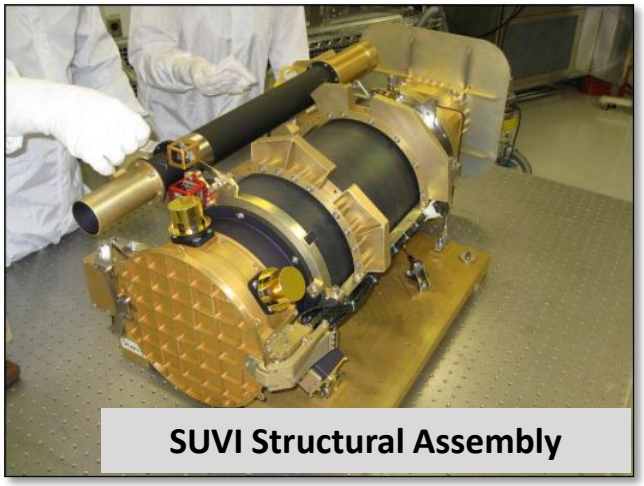
Current Status:

- **Extreme UV/X-ray Irradiance Sensor (EXIS)**
  - Completed CDR in November 2009
  - Flight fabrication is underway
- **Space Environment In-Situ Suite (SEISS)**
  - Completed CDR in June 2010
  - Flight fabrication is underway
- **Solar UV Imager (SUVI)**
  - Completed CDR in December 2009
  - Flight fabrication is underway



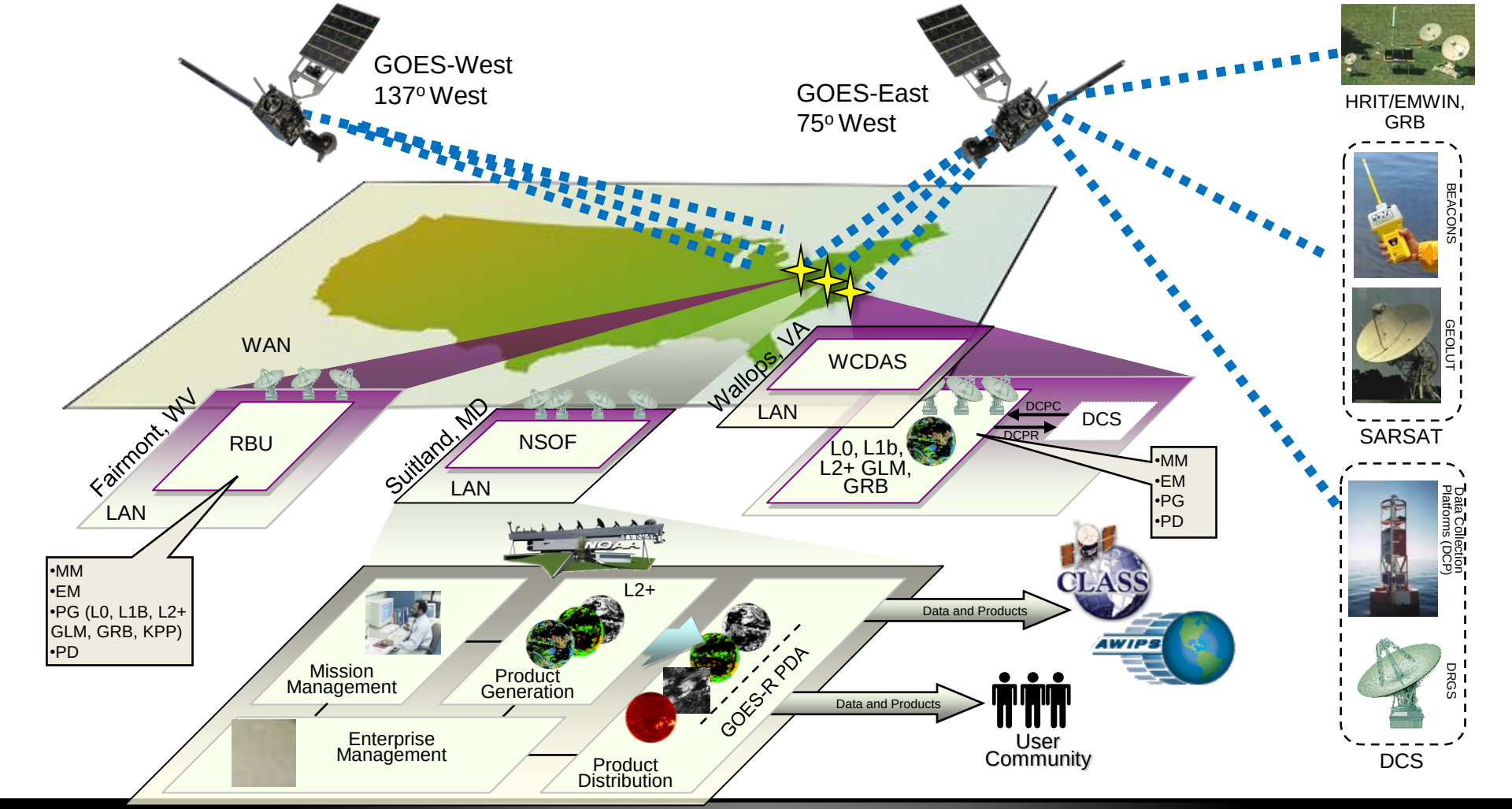
SEISS Brassboard Units


EXIS Mass Model


SUVI Structural Assembly

Ground Segment

System Architecture



Ground Segment Status

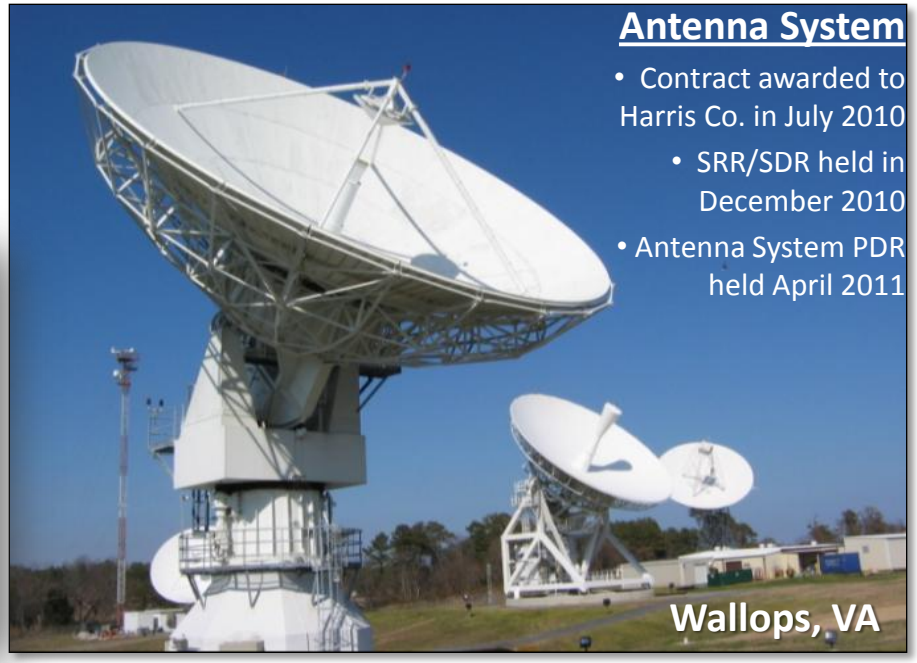
- Core GS System Definition Review (SDR)/Systems Requirements Review (SRR) successfully held in April 2010
- Completed all 18 Core GS element Software Requirements Reviews (SWRR)
- All Element PDRs are complete
- Core GS Preliminary Design Review (PDR) held March 1-4, 2011
- GS Project PDR scheduled for June 2011

NOAA Satellite Operation Facility (NSOF)
Suitland, Maryland

Ground Segment Status (con't)

Remote Backup Unit (Fairmont, WV)

- Lease signed in Dec 2009
- Site preparations are underway
- Antenna foundation construction began this spring



ESPDS/GOES-R Product Distribution & Access (PDA) System

- Evolution of legacy ESPC systems including data ingest, product processing, and distribution for future JPSS & GOES-R era
- Contract awarded to Solers, Inc. in August 2010
- ESPDS/PDA PDR is scheduled for June 20-21, 2011

GOES-R Proving Ground

- Collaborative effort between the GOES-R Program Office, selected NOAA/ NASA Cooperative Institutes, NWS forecast offices, NCEP National Centers, JCSDA, and NOAA Testbeds.

- Where proxy and simulated GOES-R products are tested, evaluated and integrated into operations before the GOES-R launch

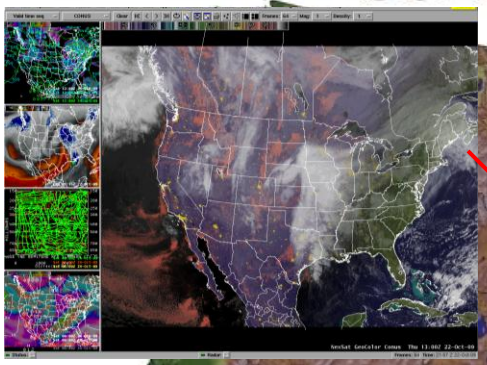
- A key element of GOES-R User Readiness (Risk Mitigation)

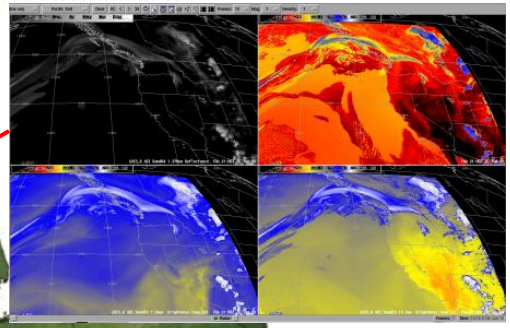
- Proving Ground activities are having an impact **NOW!**

GOES-R Proving Ground

GOES-R Proving Ground Evaluation Partners

Current as of January 2011





CIMSS – Madison, WI

MKX
Milwaukee, WI

CIRA - Ft. Collins, CO

SWPC
Boulder, CO

AWC
Kansas City, MO

OPC/HPC

SAB

STAR - Camp Springs, MD

MRX – Morristown, TN

OHX - Nashville, TN

ABQ
Albuquerque, NM

SPC
Oklahoma City, OK

SPoRT

HUN
Huntsville, AL

JAN
Jackson, MS

HGX – Houston, TX

CRP - Corpus Christi, TX

MLB
Melbourne, FL

NHC – Miami, FL

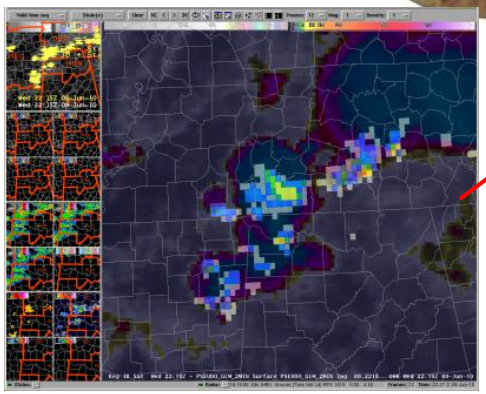
HNL

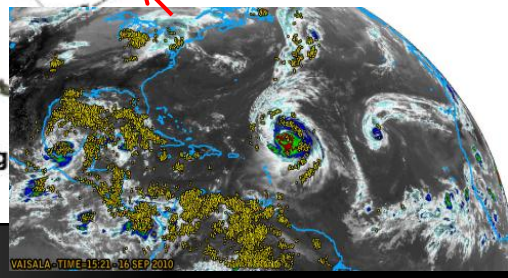
PRH

Honolulu, HI

AFG
Fairbanks, AK

ARH
Anchorag



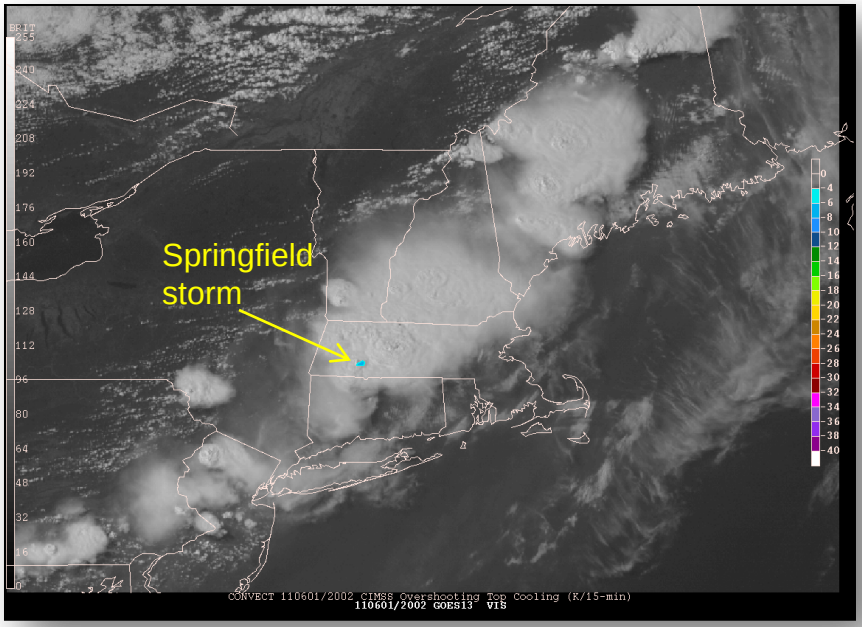


Overshooting Top Detection

- The GOES-R Overshooting Top Detection (OTD) algorithm identified an overshooting top at NOAA's Hazardous Weather Testbed with the severe thunderstorm and tornado that in Springfield, MA on June 1, 2011

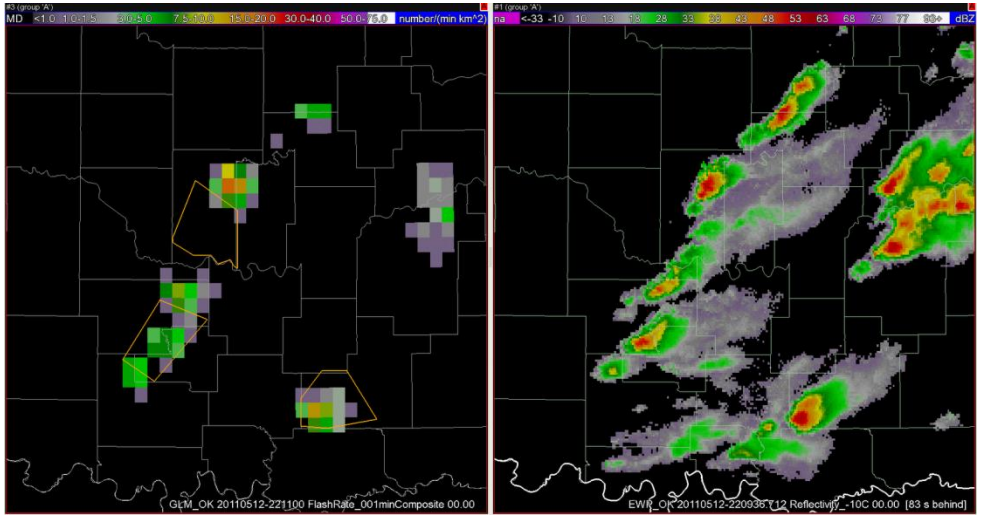
- The OTD singled out the most intense thunderstorm cell out of a very large storm complex over Southern and Central New England.

- At the HWT Experimental Warning Program and Convective Initiation desk the NWS forecasters were alerted to a developing severe storm with 28 minute lead time before the first tornado report.



Lightning Detection with the Geostationary Lightning Mapper (GLM)

- A Pseudo GLM (PGLM) total lightning product assisted in a severe thunderstorm warning at NOAA's Hazardous Weather Testbed on May 12, 2011 in Norman, Oklahoma. A rapid increase of the total lightning rate, along with the forecaster's interrogation of radar data, led to a severe thunderstorm warning, later verified with several severe hail reports.
- The PGLM flash extent density was a useful precursor in identifying when the first cloud-to-ground strikes would occur. The PGLM preceded the first cloud-to-ground strike by approximately 30 minutes.
- GLM's ability to detect in-cloud lightning before the first ground strike provides a valuable early warning indicator to enhance lightning safety
- Research using total lightning trends to diagnose severe storm intensification indicates the potential to increase warning lead-time to 20 minutes or more



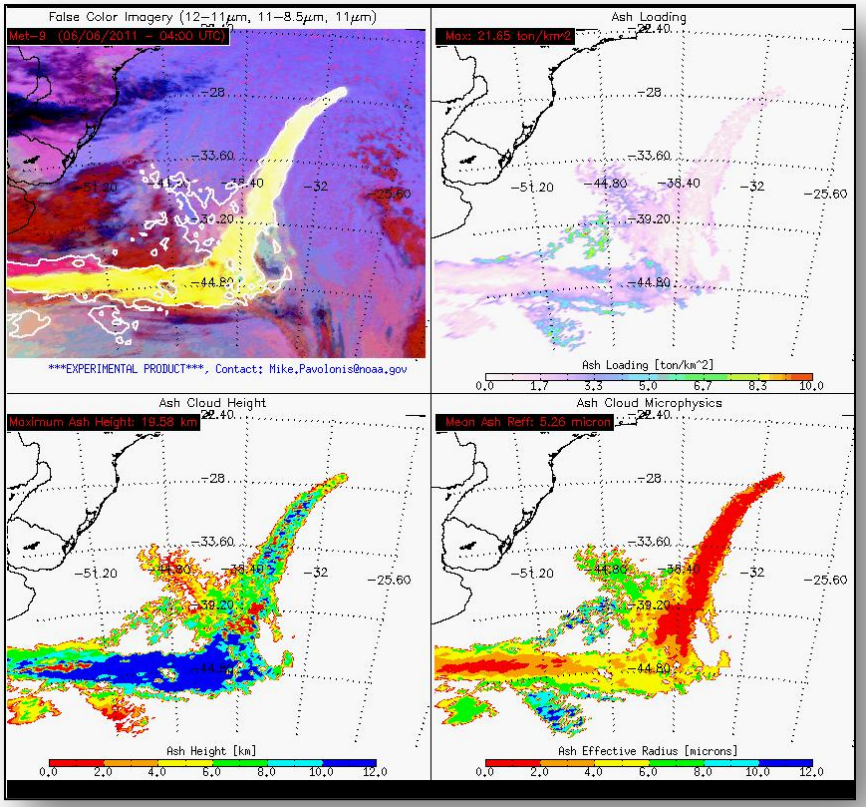
The PGLM flash extent density is on the left with the corresponding radar reflectivity on the right.

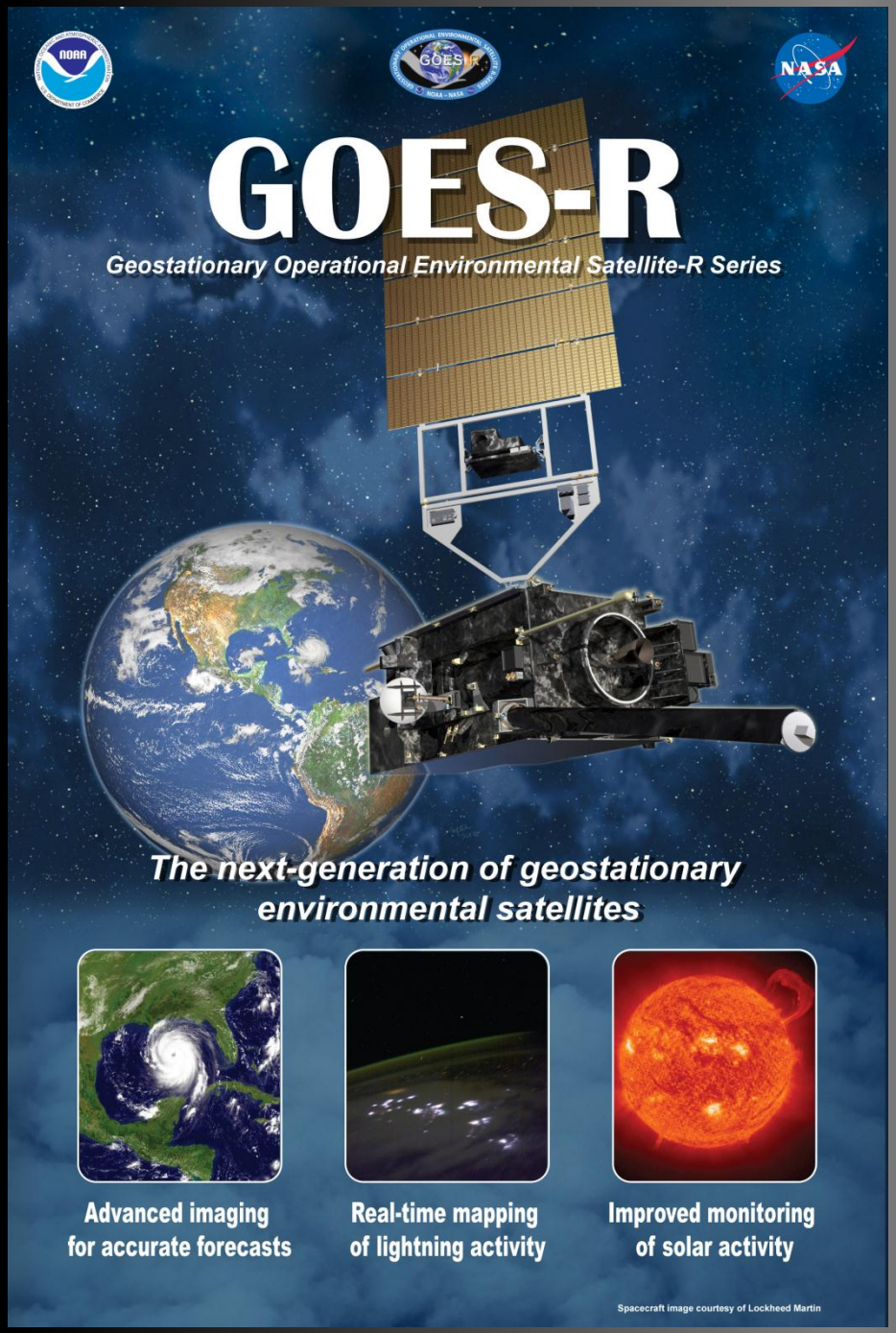
Volcanic Ash Products

- Chile's Puyehue-Cordón Caulle Volcano erupted on June 4, 2011, forming a tall ash plume above the Andes Mountains

- The GOES-R Proving Ground provides near real-time volcanic ash retrieval products (using Meteosat SEVIRI data as a proxy for the GOES-R Advanced Baseline Imager) to identify a significant volcanic ash plume emerging over the Atlantic Ocean impacting aviation operations with many cancelled flights.

- Similar data was provided by STAR to the London Volcanic Ash Advisory Center (VAAC) during the eruption of Eyjafjallajökull in Iceland in May 2010.





Thank you!

Any ???